

# CLAIMS

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1. A high-speed vision sensor, comprising:

5 a photodetector array having a plurality of photodetectors, which are arranged two-dimensionally in a plurality of rows and in a plurality of columns;

an analog-to-digital converter array having a plurality of analog-to-digital converters which are arranged one-dimensionally such that each analog-to-digital converter corresponds to one row in the photodetector array, each analog-to-digital converter converting, into digital signals, analog signals which are successively outputted from the photodetectors in the corresponding row;

10 a parallel processing system including a parallel processing element array, the parallel processing element array having a plurality of processing elements which are arranged two-dimensionally in a plurality of rows and in a plurality of columns and in one-to-one correspondence with the plurality of photodetectors in the photodetector array, each processing element performing a predetermined

15 calculation on digital signals which are transferred from the analog-to-digital converter array;

20 a column-direction data-transfer bus including a plurality of column-direction data-transfer data lines which are arranged in one to one correspondence with the plurality

25 of columns in the parallel processing system, each column-

direction data-transfer data line being connected to the processing elements that are located in the corresponding column and performing data transfer operation with each processing element in the corresponding column;

5 a row-direction data-transfer bus including a plurality of row-direction data-transfer data lines which are arranged in one to one correspondence with the plurality of rows in the parallel processing system, each row-direction data-transfer data line being connected to the processing elements that are located in the corresponding row and performing data transfer operation with each processing element in the corresponding row; and

10 a control circuit controlling the photodetector array, the analog-to-digital converter array, the parallel processing system, the column-direction data-transfer bus, and the row-direction data-transfer bus.

20 2. A high-speed vision sensor as claimed in claim 1, wherein the control circuit includes a center-of-gravity calculation control portion for controlling each column-direction data-transfer data line to perform data transfer operation to transfer positional information of the corresponding column to the processing elements on the corresponding column, for controlling each row-direction data-transfer data line to perform data transfer operation to transfer positional information of the corresponding row

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to the processing elements on the corresponding row, and for controlling each processing element to perform a predetermined calculation to calculate a center of gravity of the digital signals based on the received positional information of the corresponding row and of the corresponding column.

3. A high-speed vision sensor as claimed in claim 1, wherein the control circuit includes a control portion for controlling a predetermined processing element to perform a predetermined calculation onto the digital signals by controlling each column-direction data-transfer data line and each row-direction data-transfer data line to perform data transfer operation to transfer predetermined calculation-control data.

4. A high-speed vision sensor as claimed in claim 1, wherein the control circuit includes a data transfer control portion for controlling each column-direction data-transfer data line and each row-direction data-transfer data line to perform data transfer operation to transfer predetermined calculation-control data, thereby allowing calculation result data, obtained at a processing element which is located at a corresponding row and a corresponding column, to be transferred to the control circuit.

5. A high-speed vision sensor as claimed in claim 1, further comprising data buffers which are provided in

correspondence with the column-direction data-transfer bus and the row-direction data-transfer bus, respectively.

6. A high-speed vision sensor as claimed in claim 1, wherein the parallel processing system further includes a shift register array, the shift register array having a plurality of shift registers which are disposed in one-to-one correspondence with the plurality of analog-to-digital converters and in one-to-one correspondence with the plurality of rows of processing elements, each shift register successively transferring digital signals, which are outputted from the corresponding analog-to-digital converter and which are equivalent to signals outputted from the photodetectors in a corresponding photodetector row, to predetermined processing elements in the corresponding row.

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